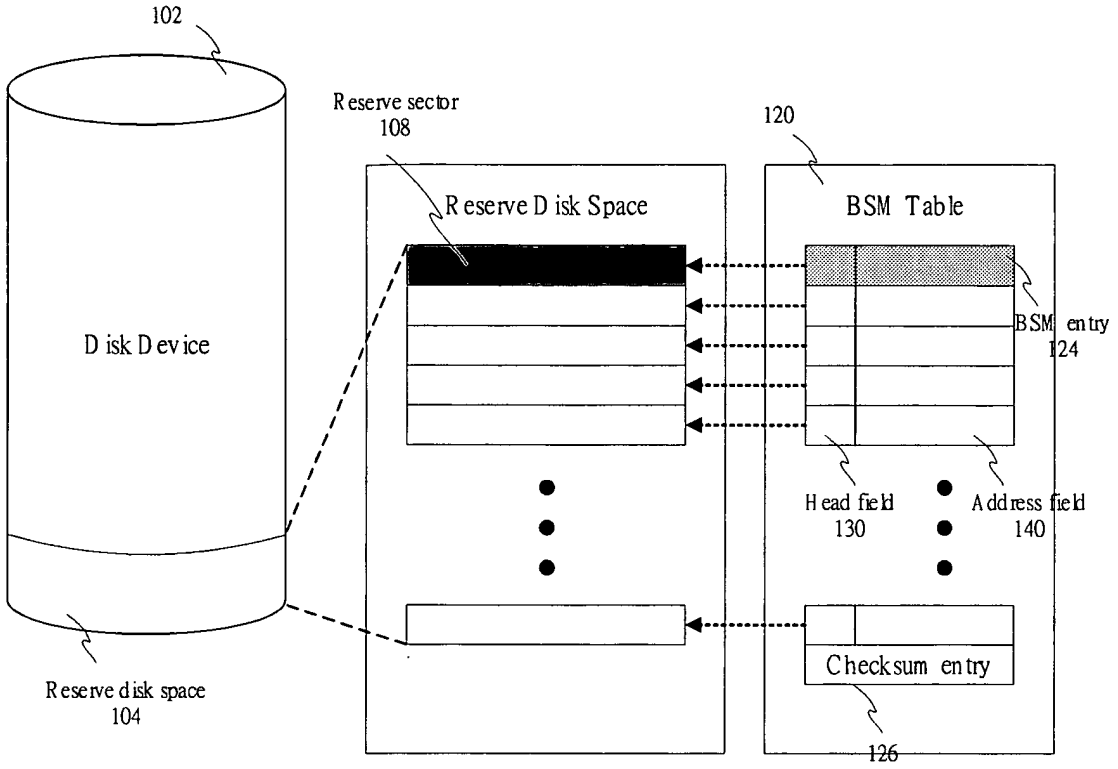
102
Reserve sector
108
120
Reserve Disk Space
BSM Table
Disk Device
BSM entry
124
Head field
130
Address field
140
Checksum entry
Reserve disk space
104
126

Fig. 1

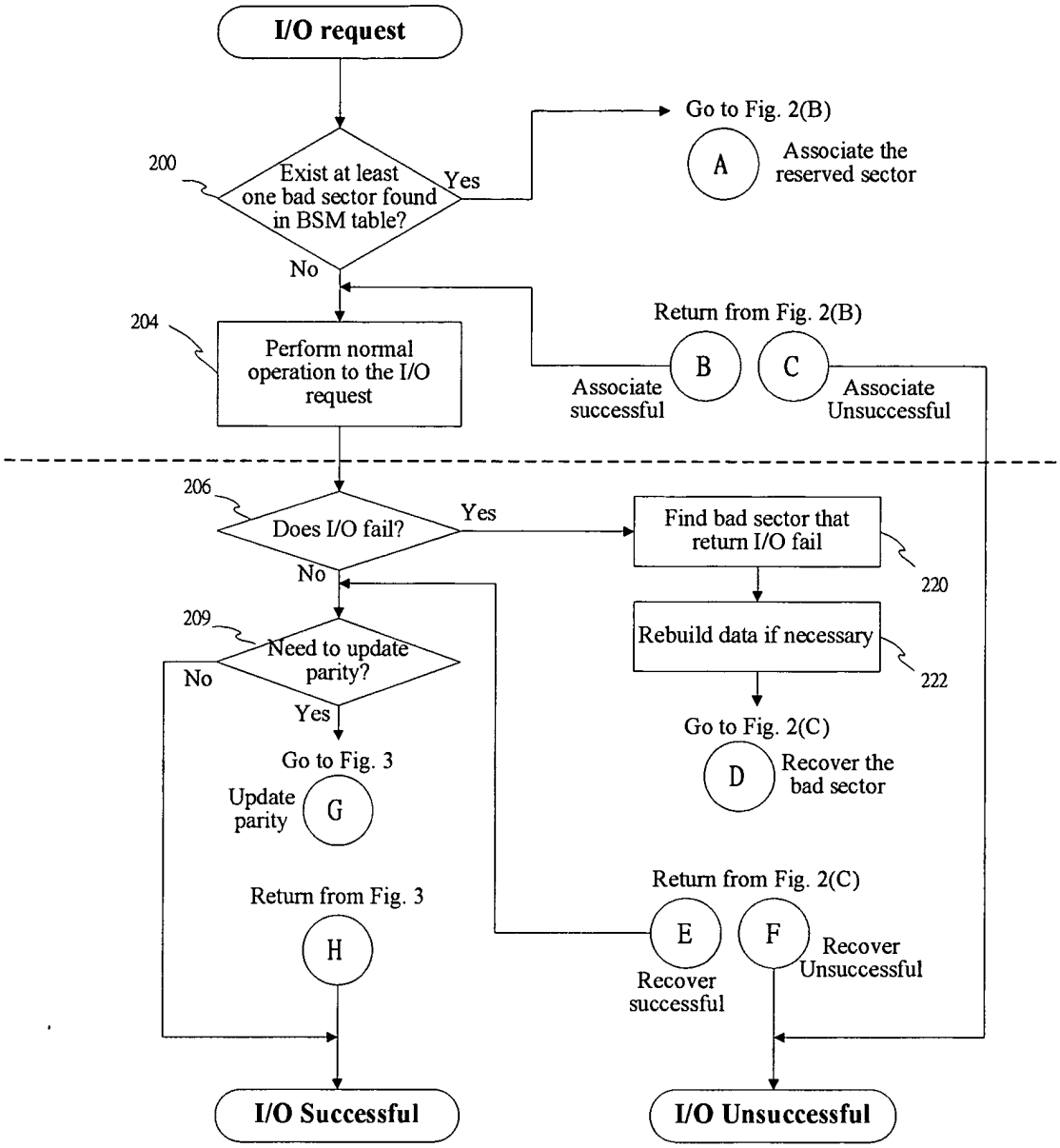
I/O request
200
Exist at least one bad sector found in BSM table?
Yes
Go to Fig. 2(B)
A
Associate the reserved sector
No
204
Perform normal operation to the I/O request
Return from Fig. 2(B)
B
C
Associate successful
Associate Unsuccessful
206
Does I/O fail?
Yes
Find bad sector that return I/O fail
220
No
209
Need to update parity?
No
Yes
Rebuild data if necessary
222
Go to Fig. 2(C)
D
Recover the bad sector
Go to Fig. 3
Update parity
G
Return from Fig. 2(C)
Return from Fig. 3
H
E
F
Recover Unsuccessful
Recover successful
I/O Successful
I/O Unsuccessful

Fig. 2(A)

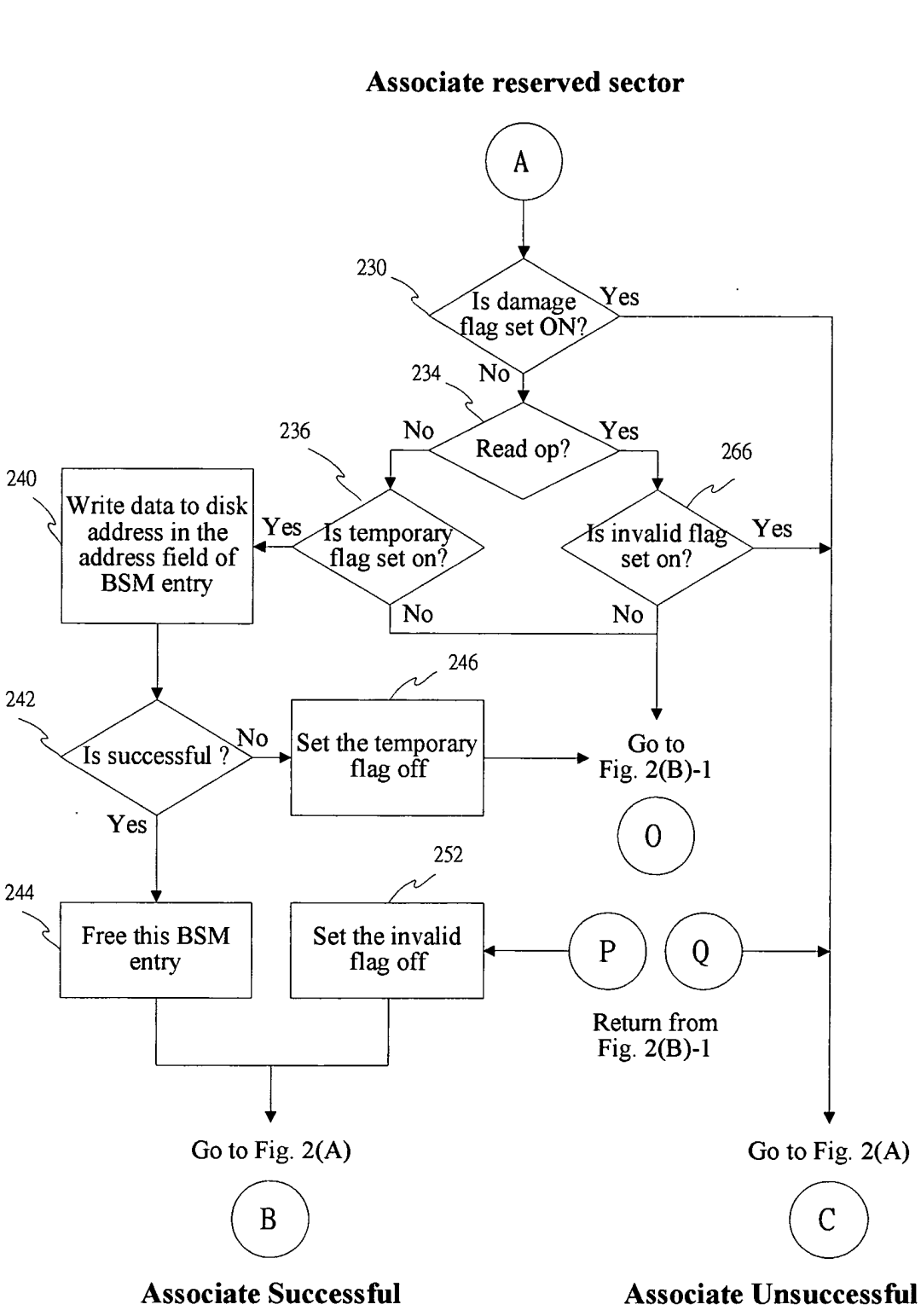
Associate reserved sector
A
230
Is damage flag set ON?
Yes
No
234
Read op?
No
Yes
236
Is temporary flag set on?
Yes
No
240
Write data to disk address in the address field of BSM entry
266
Is invalid flag set on?
Yes
No
242
Is successful ?
No
Yes
246
Set the temporary flag off
Go to Fig. 2(B)-1
O
244
Free this BSM entry
252
Set the invalid flag off
P
Q
Return from Fig. 2(B)-1
Go to Fig. 2(A)
B
Go to Fig. 2(A)
C
Associate Successful
Associate Unsuccessful

Fig. 2B

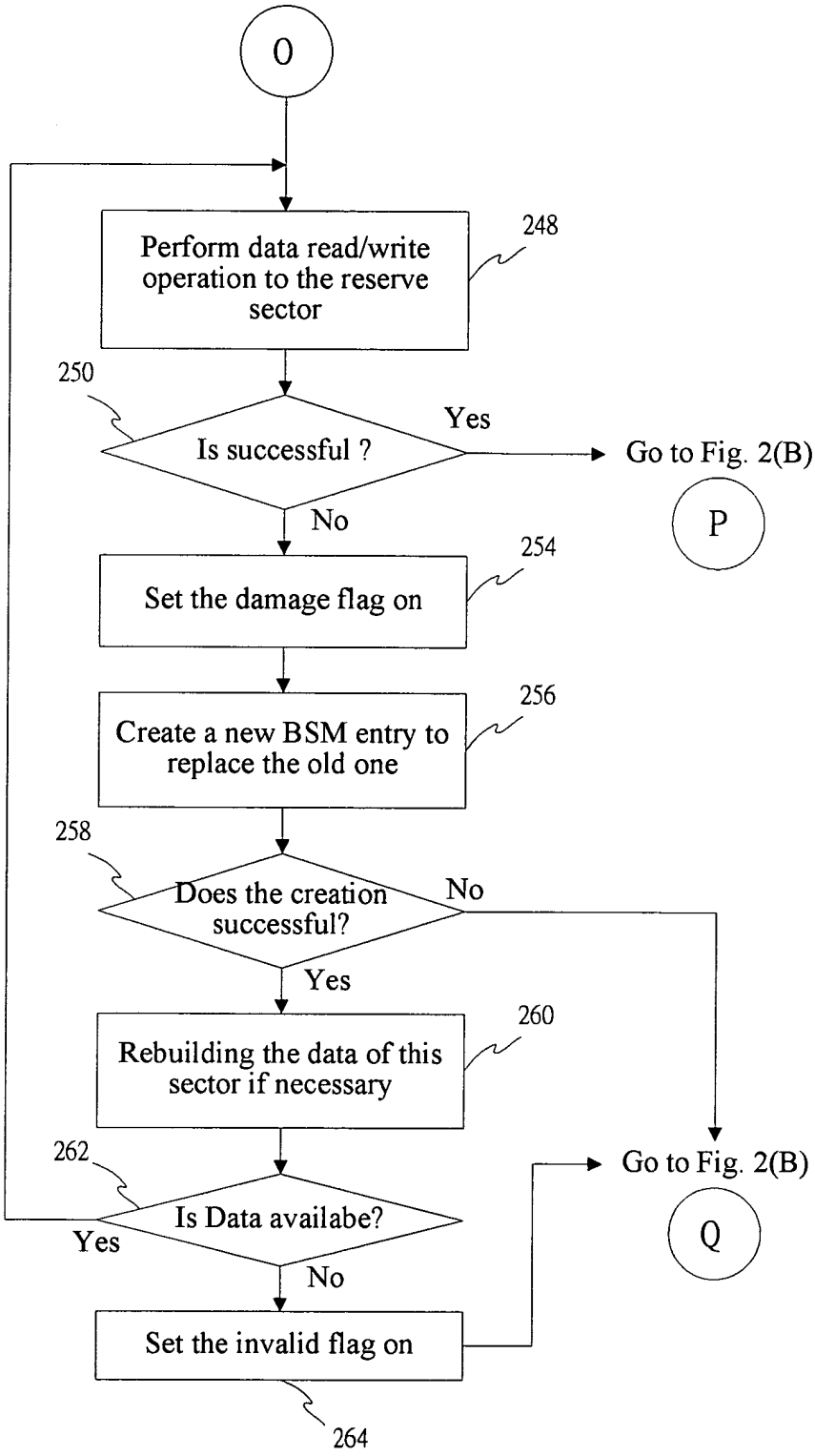
O
Perform data read/write operation to the reserve sector
248
250
Is successful ?
Yes
Go to Fig. 2(B)
P
No
254
Set the damage flag on
256
Create a new BSM entry to replace the old one
258
Does the creation successful?
No
Yes
260
Rebuilding the data of this sector if necessary
262
Is Data availabe?
Yes
No
Go to Fig. 2(B)
Q
Set the invalid flag on
264

Fig. 2(B)-1

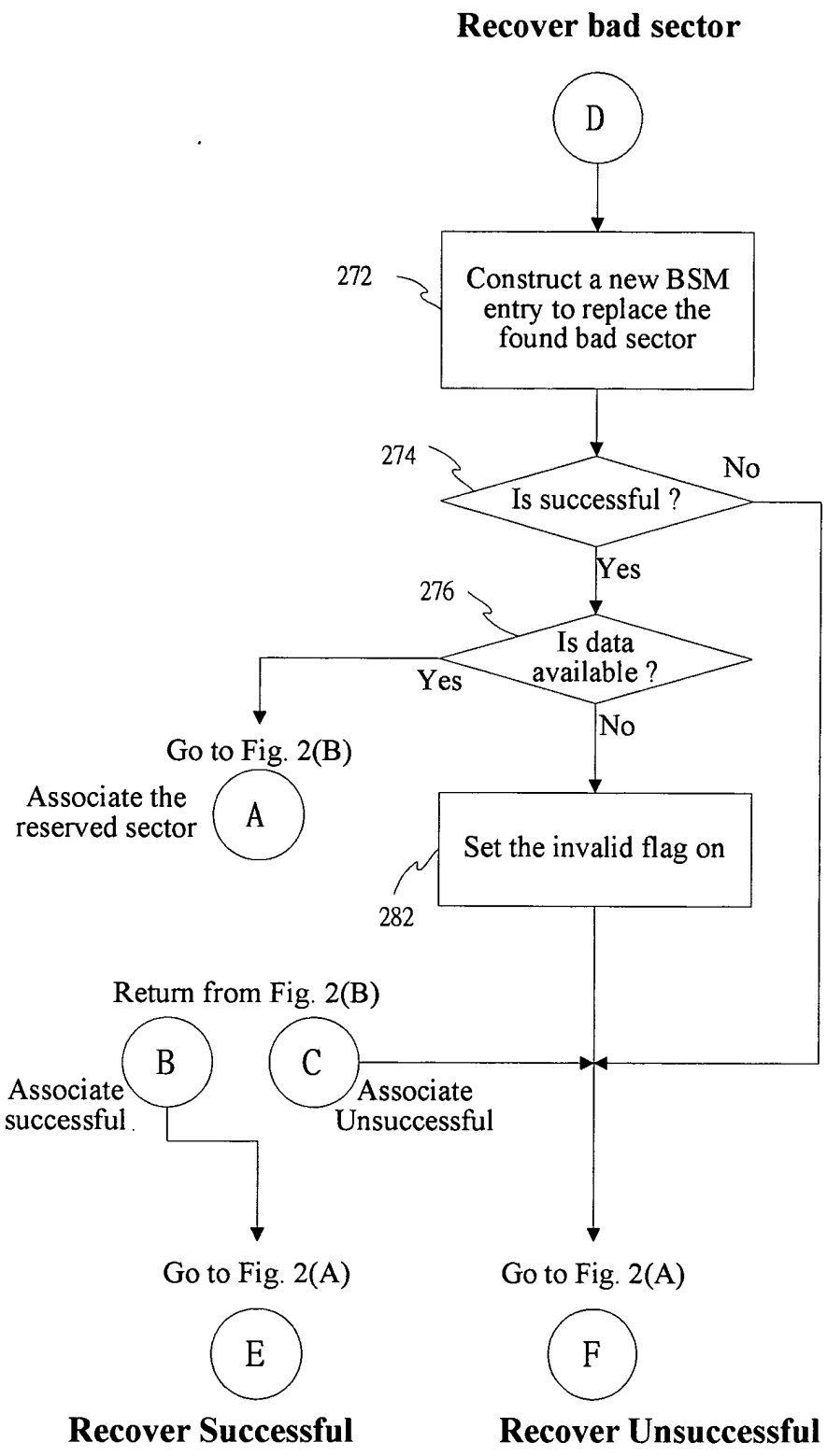
Recover bad sector
D
272
Construct a new BSM entry to replace the found bad sector
274
Is successful ?
No
Yes
276
Is data available ?
Yes
No
Go to Fig. 2(B)
Associate the reserved sector
A
Set the invalid flag on
282
Return from Fig. 2(B)
B
C
Associate successful
Associate Unsuccessful
Go to Fig. 2(A)
Go to Fig. 2(A)
E
F
Recover Successful
Recover Unsuccessful

Fig. 2C

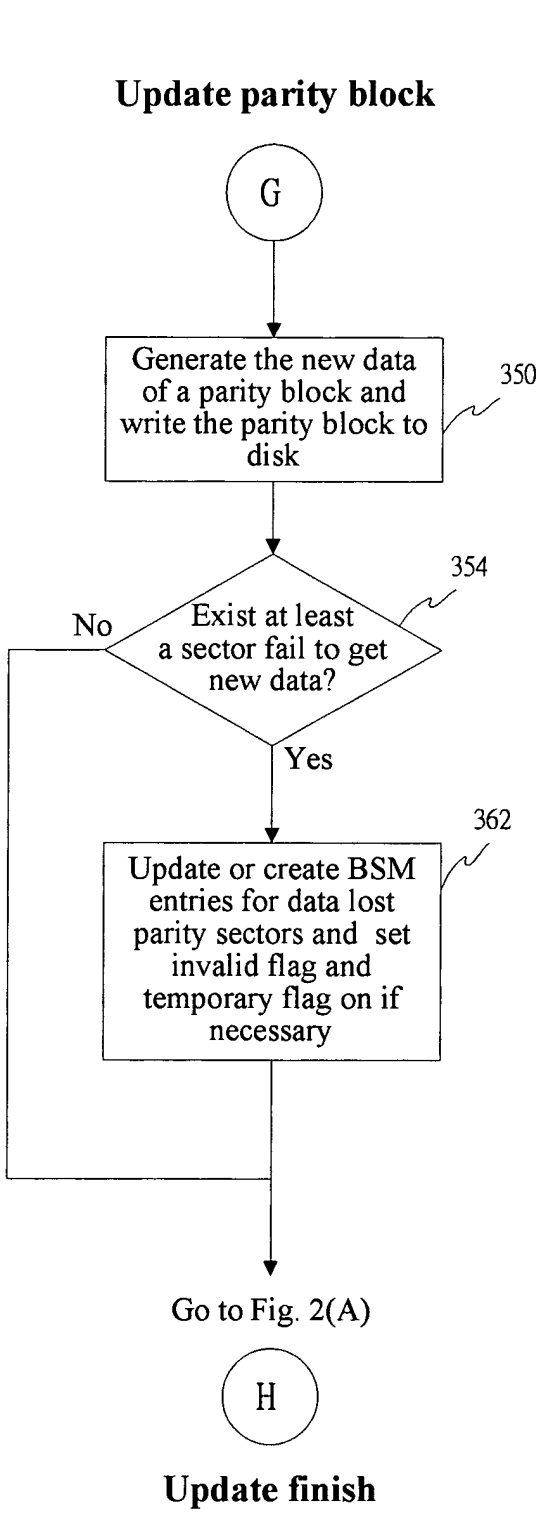
Update parity block
G
Generate the new data of a parity block and write the parity block to disk
350
354
No
Exist at least a sector fail to get new data?
Yes
362
Update or create BSM entries for data lost parity sectors and set invalid flag and temporary flag on if necessary
Go to Fig. 2(A)
H
Update finish

Fig. 3